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QUALITY OF SOVIET SCIENTIFIC AND TECHNICAL EDUCATION

Within the past 20 years the Soviets have developed an educational system which in its quantitative aspects has astounded the world. While United States educators ponder why *Johnnie* can't read, the Soviet Union is making sure that *Ivan* not only can read and write, but above all, that *Ivan* can add and subtract.

A key factor in the quality of Soviet education is its controlled training, selection, and utilization of its secondary school talent. The USSR's secondary school system, with its standardized curricula and stress on science, presents a strong base upon which to build a nation of better-than-good scientists.

This year 3-quarters of a million young people graduated from the Soviet ten-year schools. As a rule, honor students will receive a college education in one of three types of institutions - universities, polytechnical institutes, and specialized institutes. The remainder will be encouraged to go directly into industry or to specialized trade schools.

Soviet higher educational institutions have many more applications for admission than they can admit. Since vacancies in higher educational institutions are filled according to a master plan, the Soviet government can afford to base its screening process entirely on merit and to channel its best talent into priority fields of study such as physics, chemistry, and engineering.

A second factor influencing the quality of education is the Soviet system of stipends. It has been estimated that some 90% of the students attending Moscow State University, for example, receive scholarships.

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Stipends vary with the year of study, the school attended, the faculty in which the student is enrolled, and finally, according to the student's performance. Starting at about 290 rubles per month, stipends increase annually up to approximately 450 rubles per month during the final year in school. Within areas of priority, such as physics, the stipend may be 25% ^{only} more. While the maximum stipends provide a meager subsistence, they do ease the financial strain of education and provide an incentive to do a good job. If a student's marks go down, so does the amount of his stipend.

The Soviet government, recognizing that an educational system is dependent upon its pool of professionally trained talent, has given teacher training a high priority. Trained for the sole purpose of serving the State, teachers are responsible for turning out top-flight scientists and technicians. Again, as with its students, the Soviet Union has offered enticing incentives to its teachers. They become members of a highly regarded profession. They are assured social prestige and financial security.

Universities and pedagogical institutions supply the USSR with primary and secondary teachers. Training in pedagogical institutes has been increased this year from a 4-year to a 5-year course and, according to Moscow, will include a wider range of subjects. This attempt to broaden the scope of education is noteworthy. In the past, Soviet teacher training was characterized by intense specialization and devotion to methodology. Mathematics teachers, for instance, concentrated nearly

one-quarter of their training time studying techniques, presentation, and use of visual aids. While a teacher shortage still exists, it is being offset by increased training and by a system of enforced assignment. It has been estimated that some 60% of the graduates of the 35 universities within scientific fields and some 50% from other fields are being assigned to teaching.

USSR teachers in higher education are required in theory to improve their qualifications periodically, either by residence study at a college, or through correspondence courses. In addition, and again in theory, academic positions in higher educational institutions are open to competition every five years. These means are not, according to the Soviet press, always effective. Recent criticism of so-called "hangers-on" - those teachers who may not have kept up their professional competence - indicates a Soviet concern about the quality of some of its teaching. The ratio of the number of teachers in Soviet higher education is comparable to that of the U. S.

It may be assumed that in the distribution of teaching talent that both party consideration and academic record are important. However, personnel needs, particularly in research and development, often ³¹² is the determining factor. The freedom of the individual university or institute to select its staff is subordinated to centrally formulated allocations of talent between research institutes and institutions of higher education. While such placement "by direction" tends to concentrate the best academic

talent in a relatively few schools, it has, to date provided good training for a select number of Soviet youth.

Another factor relative to the quality of Soviet education, is the matter of curriculum. The lack of humanities is an indication as to why Ivan thinks as he does. The absence of so-called "make-up" courses are also characteristic of a Soviet university catalogue. In the USSR, college is not just "advanced high school." There is no opportunity to begin mathematics, or to pursue an elementary course in physics. Study is limited to training in professional subjects and skills. Furthermore, Soviet students choose their profession at the time of admission, not two or three years later as often happens in America.

The school calendar in the USSR varies from 4 to 6 years depending upon the field of study and on the category of school. Five years is standard for universities. The intense nature of this five years is evidenced by frequent self-criticism in the Soviet press of "over-burdening" students. A USSR freshman has approximately 70% more scheduled class hours than his MIT counterpart. In addition, especially in engineering, he is assigned numerous outside projects. With such a crowded schedule, one suspects that added homework, if completed at all, is done mechanically and without a creative approach.

It would not be incorrect to say that, in general, Soviet training on all levels tends to be overly academic, lacking in realistic understanding

of technical problems and applications. This may not be a handicap in pure science, but it can be in engineering or similar fields.

It would be wrong, however, to conclude that the USSR is doing nothing to correct these faults. Today they are making a determined effort to deemphasize theory and to provide more time for the application of learning. The recent stress on polytechnical training in secondary schools has been carried over into higher education. At Bauman Moscow Higher Technical School, for example, 153 weeks of the 5½ year course are devoted to academic instruction and 24 weeks to industrial practice. Engineering institutes spend from 16-36 weeks on practical work and universities from 6 - 16.

Further emphasis on the application of training is evident in a decree, issued in 1955, which states that preference in granting entrance to higher educational institutions will be given to applicants who have had two or more years of on-the-job experience. This move, aimed at attracting mature students with good training, goes hand-in-hand with a 1956 resolution regarding post-graduate work. Henceforth, according to the edict, enrollment in graduate work immediately upon graduation, will not be permitted except in such subjects as mathematics, theoretical physics, and similar disciplines. In addition, dissertations for the candidate and doctorate degrees will be accepted for defense only after their publication.

A final factor affecting the quality of Soviet higher training is the degree of specialization. An examination of schools and faculties

often gives an impression of intense specialization which can be misleading. It must be remembered, however, that in fields such as engineering, the first 2½ years are spent on general engineering subjects. It would appear therefore, that much of the Soviet "specialization" is not in place of, but in addition to broad general training. Furthermore, there appears to be a trend toward reducing the number of specialties. A Soviet reform of 1954 curtailed the number of specialties offered. One source says that they were already reduced 41% by April 1955 and that eventually there will be about 280 basic curricula instead of 460 as before.

What assumptions then can we make about the quality of Soviet scientific education?

The Soviets have excellent secondary schools, academic discipline, a standardized curriculum, control and selection of gifted students, and incentives to offer both students and teachers.

On the other hand, the Soviets are handicapped by an overly academic training, a theoretical rather than practical approach, stifling of student creativity by over-work, and a concentration of teaching talent in a relatively few outstanding schools.

We know the Soviet government is attempting to correct these trends by their reforms in teacher training, deemphasizing of theory, breaking down specialization, channeling Soviet youth with work experience into higher education, and introducing polytechnical training into secondary schools.

Compared to the United States we find Soviet future scientists have an accumulation of knowledge versus our United States philosophy of "think and apply." They emphasize discipline as opposed to our allowing students to "sink or swim." We have both produced capable scientists and technicians. How the picture will look in 1960 depends upon which of us maintains that quality of scientific education needed to meet the demands of a modern technological world.